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(54) **SWITCHABLE GLASS AND INTELLIGENT VEHICLE WINDOW**

LICHTANPASSENDES GLAS UND INTELLIGENTES FAHRZEUGFENSTER

VERRE COMMUTABLE ET FENÊTRE DE VÉHICULE INTELLIGENT

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Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the priority of the Chinese Patent Application with the Application No. 201911271293.6 filed December 12, 2019.

TECHNICAL FIELD

[0002] The present disclosure relates to the field of display vehicle window technology, and in particular to a light-adjusting glass and a smart vehicle window.

BACKGROUND

[0003] At present, the light-adjusting glass is used more and more extensively in the fields of building and traffic, and existing customers of automobiles, high-speed rails, passenger planes and the like are interested in a dye liquid crystal light-adjusting glass. Products such as Polymer Dispersed Liquid Crystal (PDLC) smart glass, electrochromic smart glass and the like exist in an existing smart glass market. The PDLC smart glass may only realize a switching between transparency and haze, and does not shade light or insulate heat; the electrochromic smart glass has the problems of a complex film forming process, a long response time (8 to 20s), bluish light in a dark state and the like. The dye liquid crystal light-adjusting glass realizes a switching between a bright state and a dark state by utilizing a selective absorption of dichroic dye molecules in liquid crystals to light, and greatly improves optical properties such as black state purity, response time and the like compared with the existing PDLC smart glass and the electrochromic smart glass.

[0004] International patent application WO2017082403 (A1) relates to, for example, even when a light control film is used as an intermediate material of laminated glass, enable effective avoidance of a reduction in external appearance quality, and sufficiently stable driving, and prevent diffracted light from being discerned by effectively avoiding a reduction in transmittance and a deterioration in liquid crystal alignment. A light control film 1 is provided with: a first laminate 13 in which an alignment layer 23B is provided; a second laminate 12 in which an alignment layer 23A is provided; a liquid crystal layer 14 which is sandwiched between the first laminate 13 and the second laminate 12 and contains liquid crystal molecules; a spacer 24 which is disposed in the liquid crystal layer 14 to hold the thickness of the liquid crystal layer 14; and electrodes 22B, 22A provided in the first laminate 13 and/or the second laminate 12, and controls transmitted light by controlling the alignment of the liquid crystal molecules by driving by the electrodes 22B, 22A, wherein the proportion of an area occupied by the spacer 2 per unit area when the light control film 1 is viewed from the front in a light controllable-region of the liquid crystal layer is 0.1-10% inclusive.

[0005] CN103135291A discloses a three dimensional (3D) liquid crystal grating device. The 3D liquid crystal grating device comprises an upper substrate and a lower substrate. The lower substrate is provided with a strip-type grating, a first conducting terminal, and a second conducting terminal, wherein the first conducting terminal is connected with the strip-type grating and inputs a first voltage signal to the strip-type grating. One side of the upper substrate, which faces towards a liquid crystal layer, is provided with a common electrode. According to the lower substrate, a ring-shaped electrode is further arranged outside the strip-type grating, the ring-shaped electrode is connected with the second conducting terminal and connected with the common electrode through frame sealing glue which contains conductive materials, so that the second conducting terminal is connected with the common electrode, and the second conducting terminal input a second voltage signal to the common electrode. The invention further provides a 3D liquid crystal display device which comprises the 3D liquid crystal grating device. The 3D liquid crystal grating device and the 3D liquid crystal display device are suitable for fluid dispensing process and full circle conduction process and can be well compatible with the prior art, so that a better conducting effect is achieved.

[0006] US2019041680A1 discloses a light control module including a light control sheet and a drive circuit that applies a voltage to a first electrode and a second electrode of the light control sheet. The light control sheet includes a light control layer switchable between a transparent state and an opaque state according to an applied voltage. The light control sheet has a feeding area for applying a voltage to the first and second electrodes. The light control sheet is formed such that when the light control sheet receives a voltage that causes a transmittance of the light control sheet to be equivalent to a Munsell value of 90% in a region closest to the feeding area, the light control sheet has a transmittance equivalent to a Munsell value of 50% in a region farthest from the feeding area, where a Munsell value of 100% is a maximum transmittance of the light control sheet.

SUMMARY

[0007] The present disclosure provides a light-adjusting glass and a smart vehicle window.

[0008] In a first aspect, the claimed invention provides a light-adjusting glass, which is according to claim 1 and inter alia has a transmittance adjustment region and an encapsulation region at least partially surrounding the transmittance adjustment region; the light-adjusting glass includes: a first substrate and a second substrate opposite to each other, and a dye liquid crystal layer between the first substrate and the second substrate in the transmittance adjustment region, and a frame sealant in the encapsulation region; wherein the first substrate includes a first base and a first electrode layer on a side of the first base proximal to the dye liquid crystal layer; the second substrate includes a second base and a second electrode layer on a side of the second base proximal to the dye liquid crystal layer; wherein, a conductive structure is in the frame sealant; a first voltage transmission structure and a second voltage transmission structure electrically insulated from each other are on the first base; the first voltage transmission structure is electrically connected to the first electrode layer; and the frame sealant at least covers a part of the second voltage transmission structure, so that the second voltage transmission structure is electrically connected to the second electrode layer through the conductive structure in the frame sealant.

[0009] Optionally, the second voltage transmission structure is in a peripheral region of the first electrode layer by at least partially surrounding the first electrode layer.

[0010] Optionally, the first electrode layer and the second electrode layer are both plate-shaped electrodes.

[0011] Optionally, the first voltage transmission structure and the first electrode layer are formed as a single piece.

[0012] Optionally, the first electrode layer includes a plurality of strip-shaped electrodes; the second electrode layer includes a plate-shaped electrode.

[0013] Optionally, the first voltage transmission structure includes a plurality of first pads and a plurality of second pads; first ends of the plurality of first pads proximal to the first electrode layer are connected to the plurality of strip-shaped electrodes, respectively; second ends of the plurality of first pads distal to the first electrode layer are electrically connected to first ends of the plurality of second pads proximal to the first electrode layer through a plurality of fan-out traces, respectively.

[0014] Optionally, the plurality of second pads are located outside the encapsulation region on the first base.

[0015] Optionally, the plurality of first pads and the second plurality of pads are in a same layer and are made of the same material as the second voltage transmission structure.

[0016] Optionally, a transition layer is at a second end of each of the plurality of second pads distal to the first electrode layer, and the transition layer is in a same layer and is made of the same material as the strip-shaped electrodes.

[0017] According to the claimed invention, the second voltage transmission structure includes: a first transmission sub-structure and a second transmission sub-structure; the first transmission sub-structure and the first voltage transmission structure are on a same side of the encapsulation region; and the second transmission sub-structure is on the other sides of the encapsulation region except the side with the first transmission sub-structure, and the first transmission sub-structure is electrically connected to the second transmission sub-structure.

[0018] Optionally, the first transmission sub-structure includes a third pad electrically connected to the second transmission sub-structure via a connection trace; the third pad and the plurality of second pads are arranged side by side; and the connection trace and the fan-out traces are arranged side by side.

[0019] Optionally, an orthographic projection of the second electrode layer on the first base covers an orthographic projection of the first transmission sub-structure on the first base.

[0020] Optionally, the light-adjusting glass further includes an interlayer insulating layer, wherein the interlayer insulating layer covers at least the first electrode layer, and exposes the first transmission sub-structure and the second transmission sub-structure.

[0021] In a second aspect, the claimed invention further provides a smart vehicle window according to claim 11 and including the above light-adjusting glass.

[0022] In a third aspect, the claimed invention further provides a method of manufacturing a light-adjusting glass, according to claim 12 and inter alia including: forming a first substrate including: manufacturing a first base and forming a first electrode layer, a first voltage transmission structure and a second voltage transmission structure on the first substrate, wherein the first voltage transmission structure and the second voltage transmission structure are electrically insulated from each other; the first electrode layer is provided in a transmittance adjustment region, and at least a part of the second voltage transmission structure is provided in an encapsulation region at least partially surrounding the transmittance adjustment region; forming a frame sealant in the encapsulation region, so that the frame sealant includes a conductive structure and a first portion which at least partially covers the second voltage transmission structure; forming a second substrate such that the second substrate includes a second base and a second electrode layer formed on the second base; and aligning and assembling the first substrate and the second substrate, so that the frame sealant is arranged between the first substrate and the second substrate and is bonded to the second electrode layer.

[0023] Optionally, the method of manufacturing a light-adjusting glass further includes forming an interlayer insulating layer on the first electrode layer to cover the first electrode layer and expose the second voltage transmission structure, before forming the frame sealant in the encapsulation region.

[0024] Optionally, forming the first electrode layer and the first voltage transmission structure includes forming the first electrode layer and the first voltage transmission structure as a single piece by a single patterning process with a same material.

[0025] Optionally, forming the first electrode layer and the first voltage transmission structure includes forming the first electrode layer including a plurality of strip-shaped electrodes and the first voltage transmission structure including a plurality of first pads and a plurality of second pads, such that first ends of the plurality of first pads proximal to the first electrode layer are connected to the plurality of strip-shaped electrodes, respectively; second ends of the plurality of first pads distal to the first electrode layer are electrically connected to first ends of the plurality of second pads proximal to the first electrode layer through a plurality of fan-out traces, respectively.

[0026] Optionally, forming the first and second voltage transmission structures includes forming the plurality of first pads, the plurality of second pads, and the second voltage transmission structure by using a same material and a same patterning process.

[0027] Optionally, forming the first and second voltage transmission structures includes forming a transition layer and the plurality of strip-shaped electrodes by using a same material and a same patterning process, wherein the transition layer is disposed at a second end of each of the plurality of second pads distal to the first electrode layer.

BRIEF DESCRIPTION OF DRAWINGS

[0028]

FIG. 1 is a schematic view of a light-adjusting glass in a bright state;
FIG. 2 is a schematic view of a light-adjusting glass in a dark state;
FIG. 3 is a top view of a first substrate of a light-adjusting glass according to an embodiment of the present disclosure;
FIG. 4 is a top view of a second voltage transmission structure on the first substrate shown in FIG. 3;
FIG. 5 is a top view of a first electrode layer and a first voltage transmission structure on the first substrate shown in FIG. 3;
FIGS. 6A and 6B are a plan view and a cross-sectional view of an interlayer insulating layer on the first substrate shown in FIG. 3, respectively;
FIG. 7 is a top view of a first substrate of a light-adjusting glass according to an embodiment of the present disclosure;
FIG. 8 is a top view of first and second voltage transmission structures on the first substrate shown in FIG. 7;
FIG. 9 is a top view of a first electrode layer on the first substrate shown in FIG. 7;
FIG. 10 is a top view of an interlayer insulating layer on the first substrate shown in FIG. 7; and
FIG. 11 is a top view of a second substrate of a light-adjusting glass according to an embodiment of the present disclosure.

DETAIL DESCRIPTION OF EMBODIMENTS

[0029] In order to make a person skilled in the art understand the technical solutions of the present disclosure better, the present disclosure is described below in detail with reference to the accompanying drawings and the specific embodiments.

[0030] Unless defined otherwise, technical or scientific terms used herein shall have ordinary meanings as understood by a person skilled in the art to which the present disclosure belongs. The use of "first," "second," and the like in the present disclosure is not intended to indicate any order, quantity, or importance, but rather is used to distinguish one element from another. Also, the use of the words "a," "an," or "the" and the like do not indicate a limitation for the number of items, but rather indicate the presence of at least one item. The word "including", "includes", "including" or "includes" and the like means that an element or item preceding the word includes an element or item listed after the word and its equivalent, but does not exclude other elements or items. The word "connected" or "coupled" and the like is not limited to physical or mechanical connections, but may include electrical connections, regardless of direct or indirect. The words "upper", "lower", "left", "right" and the like are used only to indicate relative positional relationships among objects, and when an absolute position of a described object is changed, the relative positional relationships may be changed accordingly.

[0031] It should be noted that, in the embodiment of the present disclosure, as described in the specification, a first layer is located on a second layer, which means that the first layer is not macroscopically above the second layer, but that the order for forming the layers is one by one. That is, a later formed film layer is on an earlier formed film layer.

[0032] As shown in FIGS. 1 and 2, an exemplary light-adjusting glass is provided, which includes a first substrate, a second substrate and a dye liquid crystal layer 30, wherein the first substrate and the second substrate are oppositely arranged, and the dye liquid crystal layer is arranged between the first substrate and the second substrate; the first substrate includes a first base 10, and a first electrode layer 11 and a first alignment layer 12 which are sequentially arranged on a side of the first base 10 proximal to the liquid crystal layer; the second substrate includes: a second base 20, and a second electrode layer 21 and a second alignment layer 22 which are sequentially arranged on a side of the second base 20 proximal to the liquid crystal layer; a material of the liquid crystal layer 30 includes liquid crystal molecules and dichroic dye molecules. Depending on dichroic properties of the dichroic dye molecules, only light in an incident light that is parallel to a long axis of the dye molecules may be absorbed.

[0033] Specifically, in the embodiment of the present disclosure, a case will be described as an example where the first electrode layer 11 and the second electrode layer 21 are both plate electrode layers. The light-adjusting glass is a TN-type liquid crystal cell, that is, a display mode thereof is a normally white mode. When no voltage is applied to the first electrode layer 11 and the second electrode layer 21, the light-adjusting glass is in a bright state, as shown in FIG. 1; when a voltage is applied to the first electrode layer 11 and the second electrode layer 21, the light-adjusting glass is in a dark state, as shown in FIG. 2.

[0034] In the prior art, applying a voltage to the first electrode layer 11 and the second electrode layer 21 of the light-adjusting glass mainly includes two ways of: providing pads in peripheral regions of the first base 10 and the second base 20, exposing the pads, and welding the pads with leads, respectively, so that a size of the light-adjusting glass is inevitably increased by providing the pad regions in the peripheral regions of the first base and the second base; providing pads at a location corresponding to half of the peripheral region of the first base 10, and cutting off the other half of the peripheral region; providing the pads at the positions of the peripheral region of the second base 20 corresponding to the positions where the first base 10 is cut, cutting the other half of the peripheral region, and then welding the pads with leads, respectively. Although a size of the light-adjusting glass may be reduced compared to the first way, the second way needs an additional cutting process. To solve this problem, a light-adjusting glass is provided in the following embodiments of the present disclosure.

[0035] In a first aspect, as shown in FIGS. 3 and 11, embodiments of the present disclosure provide a light-adjusting glass having an encapsulation region and a transmittance adjustment region defined by the encapsulation region; this light-adjusting glass includes: a first substrate, a second substrate, a dye liquid crystal layer 30 and a frame sealant 16, wherein the first substrate and the second substrate are provided oppositely, the dye liquid crystal layer is provided between the first substrate and the second substrate and is positioned in the transmittance adjustment region, and the frame sealant 16 is positioned in the encapsulation region; wherein, the first substrate includes: a first base 10, the first electrode layer 11 is arranged on a side of the first base 10 proximal to a dye liquid crystal layer; the second substrate includes: a second base 20, and a second electrode layer 21 disposed on a side of the second base 20 proximal to the dye liquid crystal layer. Particularly, a conductive structure is disposed in the frame sealant 16; a first voltage transmission structure 14 and a second voltage transmission structure 13 electrically insulated from each other are further provided on the first base 10; the first voltage transmission structure 14 is connected to the first electrode layer 11; the second voltage transmission structure 13 is electrically connected to the second electrode layer 21 through the conductive structure in the frame sealant 16. In this way, a voltage may be applied to the first electrode layer 11 through the first voltage transmission structure 14, and a voltage may be applied to the second electrode layer 21 through the second voltage transmission structure 13, so that the liquid crystal molecules and the dye molecules in the dye liquid crystal layer sandwiched between the first electrode layer 11 and the second electrode layer 21 are rotated to adjust the transmittance of the light irradiated to the light-adjusting glass. As shown in FIG. 3, the frame sealant 16 at least covers a portion of the second voltage transmission structure so that the conductive structure in the frame sealant 16 serves as a conductive medium between the second voltage transmission structure and the second electrode layer 21, and the second electrode layer 21 is powered by the second voltage transmission structure.

[0036] It should be noted that the conductive structure in the frame sealant 16 includes, but is not limited to, a conductive gold ball formed in the frame sealant 16 in a doped manner. Conductive gold balls may be doped at each position of the frame sealant 16, or only the position corresponding to the second voltage transmission structure 13. It should be understood that, in order to prevent the first electrode layer 11 and the second electrode layer 21 from being electrically connected, the frame sealant 16 is disposed in an insulating manner from the first electrode layer 11.

[0037] In one example, as shown in FIG. 3, the light-adjusting glass includes: a first substrate, a second substrate, a dye liquid crystal layer and a frame sealant 16, wherein the first substrate and the second substrate are provided oppositely; the dye liquid crystal layer and the frame sealant 16 are provided between the first substrate and the second substrate; wherein the first substrate includes a first base 10, and a second voltage transmission structure 13, a first electrode layer 11 and a first voltage transmission structure 14 in a same layer, and an interlayer insulating layer 15 sequentially arranged on a side of the first base 10 distal to the dye liquid crystal layer. The second substrate includes a second base 20, and a second electrode layer 21 disposed on a side of the second base 20 proximal to the dye liquid crystal layer. The first electrode layer 11 and the second electrode layer 21 each include a plate-shaped electrode. The frame sealant 16 is disposed in the encapsulation region, specifically, may be disposed on the first base 10, or may be disposed on the second base 20. In this embodiment, the frame sealant 16 is disposed on the first base 10, the second voltage transmission structure 13 at least contacts with a position where a conductive structure is provided in the frame sealant 16.

[0038] In some embodiments, the first voltage transmission structure 14 and the first electrode layer 11 are formed as a single piece. That is, as shown in FIG. 1, the first voltage transmission structure 14 and the first electrode layer 11 are integrally formed as a single piece, so that the first voltage transmission structure 14 and the first electrode layer 11 may be formed by a single patterning process. A material of the first electrode layer 11 includes, but is not limited to, Indium Tin Oxide (ITO).

[0039] In order to enhance the conductivity of the second voltage transmission structure 13, the second voltage transmission structure 13 may be made of a metal conductive material, such as copper (C_u). Since the second electrode layer 21 is a plate-shaped electrode, in order to ensure that the voltage applied on the second electrode layer 21 is uniform, at this time, the second voltage transmission structure 13 is designed as a structure composed of a first transmission sub-structure 131 and a second transmission sub-structure 132, as shown in FIG. 4; wherein, the first transmission sub-structure 131 and the first voltage transmission structure 14 are located at the same side of the encapsulation region, as shown in FIG. 5; the second transmission sub-structure 132 is located at the other sides of the encapsulation region except the side where the first transmission sub-structure 131 is located, that is, the second transmission sub-structure 132 is a U-shaped structure shown in FIG. 4, and the first transmission sub-structure 131 is electrically connected to the second transmission sub-structure 132. The interlayer insulating layer 15 is hollowed at the positions where the first transmission sub-structure and the second transmission sub-structure are located, the first transmission sub-structure and the second transmission sub-structure are exposed, and the frame sealant 16 is provided in the encapsulation region and covers the first transmission sub-structure and the second transmission sub-structure. Thus, after aligning and assembling the second substrate and the first substrate, the second electrode layer 21 may be electrically connected to the first transmission sub-structure and the second transmission sub-structure through the conductive structure in the frame sealant 16.

[0040] For the above light-adjusting glass, the embodiment of the present disclosure provides a method for manufacturing the light-adjusting glass. For convenience of description, a case will be described as an example where the light-adjusting glass is a rectangular glass, and in this case, the encapsulation region is a rectangular closed loop structure having a first side and a second side which are oppositely disposed (opposite to each other in the left-right direction in FIG. 3), and a third side and a fourth side which are oppositely disposed (opposite to each other in the up-down direction in FIG. 3). The method includes steps of forming a first substrate, a second substrate, and a dye liquid crystal layer filled between the first substrate and the second substrate.

[0041] The step of forming the first substrate includes the following steps:

Step 1, as shown in FIG. 4, the second voltage transmission structure 13 is formed on the first base 10 through a patterning process; wherein, the second voltage transmission structure 13 includes the first transmission sub-structure and the second transmission sub-structure; the first transmission sub-structure is positioned on the fourth side of the encapsulation region, and the second transmission sub-structure is a U-shaped structure and is positioned on the first side, the second side and the third side of the encapsulation region; an end of the first transmission sub-structure is a block-shaped structure, and the other end of the first transmission sub-structure and the second transmission sub-structure are formed as single piece. The first transmission sub-structure except the position of the block-shaped structure and the second transmission sub-structure are strip-shaped with a width of about 2 mm; the block-shaped structure of the first transmission sub-structure is used for being welded with an external lead, and a size of the block-shaped structure may be set according to a size of the light-adjusting glass.

Step 2, as shown in FIG. 5, a pattern including the first electrode layer 11 and the first voltage transmission structure 14 is formed through a single patterning process. The first electrode layer 11 is located in the transmittance adjustment region; the first voltage transmission structure 14 is a block-shaped structure, integrated with the first electrode layer 11, and extends from the transmittance adjustment region to a side of the fourth side of the encapsulation region distal to the transmittance adjustment region. The materials of the first electrode layer 11 and the first voltage transmission structure 14 include, but are not limited to, ITO; a width of the first voltage transmission structure 14 is around 15 mm.

Step 3, as shown in FIGS. 6A and 6B, an interlayer insulating layer 15 is formed over the layer where the first electrode layer 11 and the first voltage transmission structure 14 are located, wherein the interlayer insulating layer 15 covers the first electrode layer 11 and the first voltage transmission structure 14, and exposes the second voltage transmission structure 13. As shown in the cross-sectional view taken along a line AA' of FIG. 6A and shown in FIG. 6B, the interlayer insulating layer 15 exposes the first transmission sub-structure 131. A certain distance, of about 200 μm, exists between an edge of the interlayer insulating layer 15 and the encapsulation region, and is mainly used for insulating the first voltage transmission structure 14 from the frame sealant formed thereon for bonding to the second substrate. Therefore, the first voltage transmission structure 14 must be insulated before the frame sealant 16 for bonding to the second substrate is formed.

Step 4, as shown in FIG. 3, the frame sealant 16 is formed in the encapsulation region, wherein the frame sealant 16 is doped with conductive gold balls, a width of the frame sealant 16 may be determined according to the size of the light-adjusting glass. For a 5 inch light-adjusting glass, the width of the frame sealant 16 is between 2nm and 2.6mm. For a larger size light-adjusting glass, the width of the frame sealant 16 may be designed to be between 3mm and 5mm in consideration of a puncturing risk of the frame sealant 16.

[0042] Thus, the first substrate has been manufactured.

[0043] The step of forming the second substrate includes the following steps:

Step 1, as shown in FIG. 11, a pattern including the second electrode layer 21 is formed on the second base 20 through a patterning process; the second electrode layer 21 is sized to cover the transmittance adjustment region and the encapsulation region (corresponding to the region where the frame sealant 16 is located) when the second electrode layer 21 is assembled with the first substrate to form the light-adjusting glass, and at least a portion of the block-shaped structures of the first voltage transmission structures 14 and the second voltage transmission structures 13 is exposed by an orthographic projection of the second electrode layer 21 on the first base 10, so as to solder the leads onto the block-shaped structures of the first voltage transmission structures 14 and the second voltage transmission structures 13, so as to apply an external voltage to the first electrode layer 11 and the second electrode layer 21. The material of the second electrode layer 21 includes, but is not limited to, ITO.

[0044] It should be noted that, before forming the second electrode layer 21, an insulating layer may be formed on the second base 20 to prevent the second base 20 from being damaged when the second electrode layer 21 is etched. The frame sealant 16 may also be formed on the second substrate, as long as the frame sealant 16 bonds the first and second substrates together. Thus, the second substrate has been manufactured.

[0045] In one embodiment, as shown in FIG. 7, the structure of the light-adjusting glass is similar to that of the light-adjusting glass described above, except that the first electrode layer 11 includes a plurality of strip-shaped electrodes. In this way, different voltages are applied to the strip-shaped electrodes, such that rotation angles of liquid crystal molecules in the dye liquid crystal layer corresponding to different positions of the light-adjusting glass are different, thereby implementing a louver function. Since the first electrode layer 11 includes a plurality of strip-shaped electrodes, at this time, the first voltage transmission structure 14 includes a plurality of first pads 141 and a plurality of second pads 142 that are disposed in one-to-one correspondence with the plurality of strip-shaped electrodes; the plurality of first pads 141 may be arranged side by side, a first end of each first pad 141 is connected to the corresponding strip-shaped electrode, a second end of each first pad 141 is connected to a first end of the corresponding second pad 142 through a fan-out trace 143 located in a fan-out region, and a second end of each second pad 142 is used for bonding to a chip IC to provide a voltage to the strip-shaped electrode. The second voltage transmission structure 13 may adopt the same structure as described above. Of course, the first transmission sub-structure of the second voltage transmission structure 13 may also adopt a third pad 133 disposed side by side with the second pads 142, where the third pad 133 is connected with the second transmission sub-structure through the fan-out trace 143.

[0046] In some embodiments, the first voltage transmission structure 14 and the second voltage transmission structure 13 are disposed in a same layer and have the same material. That is, the first pads 141 and the second pads 142 in the first voltage transmission structure 14 and the first transmission sub-structure and the second transmission sub-structure in the second voltage transmission structure 13 are manufactured by a single patterning process, and the material includes, but is not limited to, a conductive metal.

[0047] In some embodiments, a transition layer may also be disposed on the second ends of the second pads 142 for better bonding of the second pads 142 with the chip IC. The material of the transition layer includes, but is not limited to, ITO. For example, the transition layer may be disposed in a same layer as the strip-shaped electrodes, that is, manufactured by a single patterning process.

[0048] For the above light-adjusting glass, the embodiment of the present disclosure provides a method for manufacturing the light-adjusting glass. For convenience of description, a case will be described as an example where the light-adjusting glass is a rectangular glass, and in this case, the encapsulation region is a rectangular closed loop structure having a first side a and a second side b which are oppositely disposed (opposite to each other in the left-right direction in FIG. 7), and a third side c and a fourth side d which are oppositely disposed (opposite to each other in the up-down direction in FIG. 7). The method includes steps of forming a first substrate, a second substrate, and a dye liquid crystal layer filled between the first substrate and the second substrate. Here, the formation of the second substrate and the dye liquid crystal layer is the same as the above steps and will not be described again.

[0049] The step of forming the first substrate includes the following steps:

Step 1, as shown in FIG. 8, the first voltage transmission structure 14 and the second voltage transmission structure 13 are formed on the first base 10 through a patterning process; wherein the first voltage transmission structure 14 includes the plurality of first pads 141 arranged side by side and the plurality of second pads 142 arranged side by side; the plurality of first pads 141 and the plurality of second pads 142 are disposed in a one-to-one correspondence, and a second end of each first pad 141 is connected to a first end of the corresponding second pad 142 through the fan-out trace 143; the second voltage transmission structure 13 includes the first transmission sub-structure (e.g., the third pad 133) and the second transmission sub-structure; the first transmission sub-structure is positioned at the fourth side d of the encapsulation region, and the second transmission sub-structure is a U-shaped structure and is positioned at the first side a, the second side b and the third side c of the encapsulation region; the first transmission sub-structure includes the third pad 133 arranged side by side with the second pads, and a first end of the third pad 133 is connected to the second transmission sub-structure through the fan-out trace 143.

Step 2, as shown in FIG. 9, the first electrode layer 11 is formed in the transmittance adjustment region through a patterning process, wherein the first electrode layer 11 includes a plurality of strip-shaped electrodes; the plurality of strip-shaped electrodes are disposed in one-to-one correspondence with the plurality of first pads 141, and each strip-shaped electrode is connected to a first end of the first pad 141. Wherein, the materials of the first electrode layer 11 and the first voltage transmission structure 14 include, but are not limited to, ITO; a width of the first voltage transmission structure 14 (i.e., a size of the plurality of first pads 141 and the plurality of second pads 142 in a direction perpendicular to an extending direction of the strip-shaped electrodes) is about 15 mm. Further, a transition layer is formed at the second ends of the second pads 142 while the strip-shaped electrodes are formed in this step, and a size of the transition layer is about 800 $\mu m \times 500$ μm.

Step 3, as shown in FIG. 10, the interlayer insulating layer 15 is formed above the layer where the first electrode layer 11 is located, wherein the interlayer insulating layer 15 covers the first electrode layer 11 and a portion of the first voltage transmission structure 14. In the embodiment shown in FIG. 10, the interlayer insulating layer 15 covers the plurality of first pads 141 arranged side by side in the first voltage transmission structure 14, exposes the plurality of second pads 142 arranged side by side, and exposes the second voltage transmission structure 13. A certain distance, of about 200 μm, exists between the edge of the interlayer insulating layer 15 and the encapsulation region.

Step 4, as shown in FIG. 7, the frame sealant 16 is formed in the encapsulation region, wherein the frame sealant 16 is doped with conductive gold balls. The frame sealant 16 completely covers the first transmission sub-structure of the second voltage transmission structure 13 at the first side a, the second side b and the third side c; and covers the plurality of first pads 141 arranged side by side in the first voltage transmission structure 14, which is covered by the interlayer insulating layer 15 at the fourth side d; but exposes the second transmission sub-structure (i.e., the third pad 133). The exposed plurality of second pads 142 and the third pad 133 are used for an external power supply.

[0050] Thus, the first substrate has been completed.

[0051] In a second aspect, the present disclosure provides a smart vehicle window, which includes the above light-adjusting glass.

[0052] The smart vehicle window may be applied to an airplane, a building, and the like.

[0053] It should be understood that the above embodiments are merely exemplary embodiments employed to illustrate the principles of the present disclosure, but the present disclosure is not limited thereto. It will be apparent to a person skilled in the art that various changes and modifications may be made therein, the scope of the invention being defined by the appended claims.

Claims

1. A light-adjusting glass, which has a transmittance adjustment region and an encapsulation region at least partially surrounding the transmittance adjustment region; the light-adjusting glass comprises: a first substrate and a second substrate opposite to each other, and a dye liquid crystal layer (30) between the first substrate and the second substrate in the transmittance adjustment region, and a frame sealant (16) in the encapsulation region; wherein the first substrate comprises a first base (10) and a first electrode layer (11) on a side of the first base (10) proximal to the dye liquid crystal layer (30); the second substrate comprises a second base (20) and a second electrode layer (21) on a side of the second base (20) proximal to the dye liquid crystal layer (30); **characterized in that**

a conductive structure is provided in the frame sealant (16);

a first voltage transmission structure (14) and a second voltage transmission structure (13) electrically insulated from each other are on the first base (10);

the first voltage transmission structure (14) is electrically connected to the first electrode layer (11); and

the frame sealant (16) at least covers a part of the second voltage transmission structure (13), so that the second voltage transmission structure (13) is electrically connected to the second electrode layer (21) through the conductive structure in the frame sealant (16),

wherein the second voltage transmission structure (13) comprises: a first transmission sub-structure (131) and a second transmission sub-structure (132);

the first transmission sub-structure (131) and the first voltage transmission structure (14) are on a same side of the encapsulation region; and

the second transmission sub-structure (132) is on the other sides of the encapsulation region except the side provided with the first transmission sub-structure (131), and is a U-shaped structure and is positioned on a first side, a second side and a third side of the encapsulation region; the first transmission sub-structure (131) is positioned on a fourth side of the encapsulation region;

and the first transmission sub-structure (131) is electrically connected to the second transmission sub-structure (132); and

an end of the first transmission sub-structure (131) is a block-shaped structure, and the other end of the first transmission sub-structure (131) and the second transmission sub-structure (132) are formed as a single piece.

2. The light-adjusting glass of claim 1, wherein the second voltage transmission structure (13) is in a peripheral region of the first electrode layer (11) by at least partially surrounding the first electrode layer (11).

3. The light-adjusting glass of claim 1 or 2, wherein the first electrode layer (11) and the second electrode layer (21) both comprise plate-shaped electrodes.

4. The light-adjusting glass of claim 3, wherein the first voltage transmission structure (14) and the first electrode layer (11) are formed as a single piece.

5. The light-adjusting glass of claim 1 or 2, wherein the first electrode layer (11) comprises a plurality of strip-shaped electrodes; and the second electrode layer (21) comprises a plate-shaped electrode.

6. The light-adjusting glass of claim 5, wherein the first voltage transmission structure (14) comprises a plurality of first pads (141) and a plurality of second pads (142);

first ends of the plurality of first pads (141) proximal to the first electrode layer (11) are coupled to the plurality of strip-shaped electrodes, respectively;

second ends of the plurality of first pads (141) distal to the first electrode layer (11) are electrically coupled to first ends of the plurality of second pads (142) proximal to the first electrode layer (11) through a plurality of fan-out traces (143), respectively,

preferably, the plurality of second pads (142) are provided on the first base (10) outside the encapsulation region.

7. The light-adjusting glass of claim 6, wherein the plurality of first pads (141) and the second plurality of pads are in a same layer and are made of a same material as the second voltage transmission structure (13); or

the light-adjusting glass further comprises a transition layer which is provided at a second end of each of the plurality of second pads (142) distal to the first electrode layer (11), and the transition layer is in a same layer and is made of a same material as the strip-shaped electrodes.

8. The light-adjusting glass of any one of claims 6 to 7, wherein the end of the the first transmission sub-structure (131) is a third pad electrically connected to the second transmission sub-structure (132) via a connection trace;

the third pad and the plurality of second pads (142) are arranged side by side; and

the connection trace and the fan-out traces (143) are arranged side by side.

9. The light-adjusting glass of claim 7, wherein an orthographic projection of the second electrode layer (21) on the first base (10) covers an orthographic projection of the first transmission sub-structure (131) on the first base (10).

10. The light-adjusting glass of any one of claims 8 to 9, further comprising an interlayer insulating layer, wherein the interlayer insulating layer covers at least the first electrode layer (11), and exposes the first transmission sub-structure (131) and the second transmission sub-structure (132).

11. A smart vehicle window, comprising the light-adjusting glass of any one of claims 1 to 10.

12. A method for manufacturing a light-adjusting glass, comprising:

forming a first substrate, comprising: preparing a first base (10) and forming a first electrode layer (11), a first voltage transmission structure (14) and a second voltage transmission structure (13) on the first substrate, wherein the first voltage transmission structure (14) and the second voltage transmission structure (13) are electrically insulated from each other; the first electrode layer (11) is provided in a transmittance adjustment region, and at least a part of the second voltage transmission structure (13) is provided in an encapsulation region at least partially surrounding the transmittance adjustment region;

forming a frame sealant (16) in the encapsulation region such that the frame sealant (16) comprises a conductive structure and a first portion which at least partially covers the second voltage transmission structure (13);

forming a second substrate such that the second substrate comprises a second base (20) and a second electrode layer (21) formed on the second base (20); and

aligning and assembling the first substrate and the second substrate such that the frame sealant (16) is arranged between the first substrate and the second substrate and is bonded to the second electrode layer (21), wherein the second voltage transmission structure (13) comprises: a first transmission sub-structure (131) and a second transmission sub-structure (132);

the first transmission sub-structure (131) and the first voltage transmission structure (14) are on a same side of the encapsulation region; and

the second transmission sub-structure (132) is on the other sides of the encapsulation region except the side provided with the first transmission sub-structure (131), and is a U-shaped structure and is positioned on a first side, a second side and a third side of the encapsulation region; the first transmission sub-structure (131) is positioned on a fourth side of the encapsulation region; and the first transmission sub-structure (131) is electrically connected to the second transmission sub-structure (132); and

an end of the first transmission sub-structure (131) is a block-shaped structure, and the other end of the first transmission sub-structure (131) and the second transmission sub-structure (132) are formed as a single piece.

13. The method for manufacturing a light-adjusting glass of claim 12, further comprising forming an interlayer insulating layer on the first electrode layer (11) to cover the first electrode layer (11) and expose the second voltage transmission structure (13), before forming the frame sealant (16) in the encapsulation region.

14. The method for manufacturing a light-adjusting glass of claim 12 or 13, wherein forming the first electrode layer (11) and the first voltage transmission structure (14) comprises forming the first electrode layer (11) and the first voltage transmission structure (14) as a single piece by a single patterning process with a same material; or

wherein forming the first electrode layer (11) and the first voltage transmission structure (14) comprises forming the first electrode layer (11) comprising a plurality of strip-shaped electrodes and the first voltage transmission structure (14) comprising a plurality of first pads (141) and a plurality of second pads (142), such that first ends of the plurality of first pads (141) proximal to the first electrode layer (11) are connected to the plurality of strip-shaped electrodes, respectively; second ends of the plurality of first pads (141) distal to the first electrode layer (11) are electrically connected to first ends of the plurality of second pads (142) proximal to the first electrode layer (11) through a plurality of fan-out traces (143), respectively.

15. The method for manufacturing a light-adjusting glass of claim 14, wherein forming the first and second voltage transmission structures (13, 14) comprises forming the plurality of first pads (141), the plurality of second pads (142), and the second voltage transmission structure (13) by a single patterning process with a same material, or

wherein forming the first and second voltage transmission structures (13, 14) comprises forming a transition layer and the plurality of strip-shaped electrodes by a single patterning process with a same material such that the transition layer is disposed at a second end of each of the plurality of second pads (142) distal to the first electrode layer (11).

Patentansprüche

1. Lichtanpassendes Glas mit einem

Durchlässigkeitsanpassungsbereich und einem Einkapselungsbereich, der den Durchlässigkeitsanpassungsbereich mindestens teilweise umgibt; wobei das lichtanpassende Glas aufweist: ein erstes Substrat und ein zweites Substrat, die einander gegenüberliegen, und eine Farbstoff-Flüssigkristallschicht (30) zwischen dem ersten Substrat und dem zweiten Substrat in dem Durchlässigkeitsanpassungsbereich und eine Rahmenabdichtung (16) in dem Einkapselungsbereich; wobei das erste Substrat eine erste Basis (10) und eine erste Elektrodenschicht (11) auf einer Seite der ersten Basis (10) nahe der Farbstoff-Flüssigkristallschicht (30) aufweist; das zweite Substrat eine zweite Basis (20) und eine zweite Elektrodenschicht (21) auf einer Seite der zweiten Basis (20) nahe der Farbstoff-Flüssigkristallschicht (30) aufweist; **dadurch gekennzeichnet, dass**

in der Rahmenabdichtung (16) eine leitfähige Struktur vorgesehen ist;

eine erste Spannungsübertragungsstruktur (14) und eine zweite Spannungsübertragungsstruktur (13), die elektrisch voneinander isoliert sind, sich auf der ersten Basis (10) befinden;

die erste Spannungsübertragungsstruktur (14) elektrisch mit der ersten Elektrodenschicht (11) verbunden ist; und

die Rahmenabdichtung (16) mindestens einen Teil der zweiten Spannungsübertragungsstruktur (13) bedeckt, so dass die zweite Spannungsübertragungsstruktur (13) über die leitfähige Struktur in der Rahmenabdichtung (16) elektrisch mit der zweiten Elektrodenschicht (21) verbunden ist,

wobei die zweite Spannungsübertragungsstruktur (13) aufweist: eine erste Übertragungsteilstruktur (131) und eine zweite Übertragungsteilstruktur (132);

die erste Übertragungsteilstruktur (131) und die erste Spannungsübertragungsstruktur (14) sich auf einer gleichen Seite des Einkapselungsbereichs befinden; und

die zweite Übertragungsteilstruktur (132) sich auf den anderen Seiten des Einkapselungsbereichs mit Ausnahme der Seite befindet, die mit der ersten Übertragungsteilstruktur (131) versehen ist, und eine U-förmige Struktur aufweist und auf einer ersten Seite, einer zweiten Seite und einer dritten Seite des Einkapselungsbereichs positioniert ist; die erste Übertragungsteilstruktur (131) auf einer vierten Seite des Einkapselungsbereichs positioniert ist; und die erste Übertragungsteilstruktur (131) elektrisch mit der zweiten Übertragungsteilstruktur (132) verbunden ist; und

ein Ende der ersten Übertragungsteilstruktur (131) eine blockförmige Struktur ist und das andere Ende der ersten Übertragungsteilstruktur (131) und die zweite Übertragungsteilstruktur (132) als ein einziges Teil gebildet sind.

2. Lichtanpassendes Glas nach Anspruch 1, wobei die zweite Spannungsübertragungsstruktur (13) sich in einem Randbereich der ersten Elektrodenschicht (11) befindet, indem sie die erste Elektrodenschicht (11) mindestens teilweise umgibt.

3. Lichtanpassendes Glas nach Anspruch 1 oder 2, wobei die erste Elektrodenschicht (11) und die zweite Elektrodenschicht (21) beide plattenförmige Elektroden aufweisen.

4. Lichtanpassendes Glas nach Anspruch 3, wobei die erste Spannungsübertragungsstruktur (14) und die erste Elektrodenschicht (11) als ein einziges Teil gebildet sind.

5. Lichtanpassendes Glas nach Anspruch 1 oder 2, wobei die erste Elektrodenschicht (11) mehrere streifenförmige Elektroden aufweist und die zweite Elektrodenschicht (21) eine plattenförmige Elektrode aufweist.

6. Lichtanpassendes Glas nach Anspruch 5, wobei die erste Spannungsübertragungsstruktur (14) mehrere erste Pads (141) und mehrere zweite Pads (142) aufweist;

erste Enden der mehreren ersten Pads (141) nahe der ersten Elektrodenschicht (11) jeweils mit den mehreren streifenförmigen Elektroden gekoppelt sind;

zweite Enden der mehreren ersten Pads (141) entfernt von der ersten Elektrodenschicht (11) über mehrere Fan-out-Bahnen (143) jeweils mit den ersten Enden der mehreren zweiten Pads (142) nahe der ersten Elektrodenschicht (11) elektrisch gekoppelt sind,

vorzugsweise die mehreren zweiten Pads (142) auf der ersten Basis (10) außerhalb des Einkapselungsbereichs vorgesehen sind.

7. Lichtanpassendes Glas nach Anspruch 6, wobei die mehreren ersten Pads (141) und die mehreren zweiten Pads sich in einer gleichen Schicht befinden und aus dem gleichen Material wie die zweite Spannungsübertragungsstruktur (13) hergestellt sind; oder

das lichtanpassende Glas ferner eine Übergangsschicht aufweist, die an einem zweiten Ende jedes der mehreren zweiten Pads (142) entfernt von der ersten Elektrodenschicht (11) vorgesehen ist, und die Übergangsschicht sich in einer gleichen Schicht befindet und aus einem gleichen Material wie die streifenförmigen Elektroden hergestellt ist.

8. Lichtanpassendes Glas nach einem der Ansprüche 6 bis 7, wobei das Ende der ersten Übertragungsteilstruktur (131) ein drittes Pad ist, das über eine Verbindungsbahn elektrisch mit der zweiten Übertragungsteilstruktur (132) verbunden ist;

das dritte Pad und die mehreren zweiten Pads (142) nebeneinander angeordnet sind; und

die Verbindungsbahn und die Fan-out-Bahnen (143) nebeneinander angeordnet sind.

9. Lichtanpassendes Glas nach Anspruch 7, wobei eine orthographische Projektion der zweiten Elektrodenschicht (21) auf der ersten Basis (10) eine orthographische Projektion der ersten Übertragungsteilstruktur (131) auf der ersten Basis (10) bedeckt.

10. Lichtanpassendes Glas nach einem der Ansprüche 8 bis 9, ferner eine Zwischenschicht-Isolierschicht aufweisend, wobei die Zwischenschicht-Isolierschicht mindestens die erste Elektrodenschicht (11) bedeckt und die erste Übertragungsteilstruktur (131) und die zweite Übertragungsteilstruktur (132) freilegt.

11. Intelligentes Fahrzeugfenster, das lichtanpassende Glas nach einem der Ansprüche 1 bis 10 aufweisend.

12. Verfahren zur Herstellung eines lichtanpassenden Glases, umfassend:
Bilden eines ersten Substrats, umfassend:

Vorbereiten einer ersten Basis (10) und Bilden einer ersten Elektrodenschicht (11), einer ersten Spannungsübertragungsstruktur (14) und einer zweiten Spannungsübertragungsstruktur (13) auf dem ersten Substrat, wobei die erste Spannungsübertragungsstruktur (14) und die zweite Spannungsübertragungsstruktur (13) elektrisch voneinander isoliert werden; die erste Elektrodenschicht (11) in einem Durchlässigkeitsanpassungsbereich vorgesehen wird und mindestens ein Teil der zweiten Spannungsübertragungsstruktur (13) in einem Einkapselungsbereich vorgesehen wird, der den Durchlässigkeitsanpassungsbereich mindestens teilweise umgibt;

Bilden einer Rahmenabdichtung (16) in dem Einkapselungsbereich, so dass die Rahmenabdichtung (16) eine leitfähige Struktur und einen ersten Abschnitt aufweist, der die zweite Spannungsübertragungsstruktur (13) mindestens teilweise bedeckt;

Bilden eines zweiten Substrats, so dass das zweite Substrat eine zweite Basis (20) und eine zweite Elektrodenschicht (21) aufweist, die auf der zweiten Basis (20) gebildet wird; und

Ausrichten und Zusammenfügen des ersten Substrats und des zweiten Substrats, so dass die Rahmenabdichtung (16) zwischen dem ersten Substrat und dem zweiten Substrat angeordnet wird und an die zweite Elektrodenschicht (21) gebonded wird,

wobei die zweite Spannungsübertragungsstruktur (13) aufweist: eine erste Übertragungsteilstruktur (131) und eine zweite Übertragungsteilstruktur (132);

die erste Übertragungsteilstruktur (131) und die erste Spannungsübertragungsstruktur (14) sich auf einer gleichen Seite des Einkapselungsbereichs befinden; und

die zweite Übertragungsteilstruktur (132) sich auf den anderen Seiten des Einkapselungsbereichs mit Ausnahme der Seite, die mit der ersten Übertragungsteilstruktur (131) versehen ist, befindet und eine U-förmige Struktur aufweist und auf einer ersten Seite, einer zweiten Seite und einer dritten Seite des Einkapselungsbereichs positioniert wird; die erste Übertragungsteilstruktur (131) auf einer vierten Seite des Einkapselungsbereichs positioniert wird; und die erste Übertragungsteilstruktur (131) elektrisch mit der zweiten Übertragungsteilstruktur (132) verbunden wird; und

ein Ende der ersten Übertragungsteilstruktur (131) eine blockförmige Struktur aufweist und das andere Ende der ersten Übertragungsteilstruktur (131) und die zweite Übertragungsteilstruktur (132) als ein einziges Teil gebildet werden.

13. Verfahren zur Herstellung eines lichtanpassenden Glases nach Anspruch 12, ferner vor dem Bilden der Rahmenabdichtung (16) in dem Einkapselungsbereich ein Bilden einer Zwischenschicht-Isolierschicht auf der ersten Elektrodenschicht (11) umfassend, um die erste Elektrodenschicht (11) zu bedecken und die zweite Spannungsübertragungsstruktur (13) freizulegen.

14. Verfahren zur Herstellung eines lichtanpassenden Glases nach Anspruch 12 oder 13, wobei das Bilden der ersten Elektrodenschicht (11) und der ersten Spannungsübertragungsstruktur (14) ein Bilden der ersten Elektrodenschicht (11) und der ersten Spannungsübertragungsstruktur (14) als ein einziges Teil durch einen einzigen Strukturierungsvorgang mit einem gleichen Material umfasst; oder

wobei das Bilden der ersten Elektrodenschicht (11) und der ersten Spannungsübertragungsstruktur (14) ein Bilden der ersten Elektrodenschicht (11), die mehrere streifenförmige Elektroden aufweist, und der ersten Spannungsübertragungsstruktur (14), die mehrere erste Pads (141) und mehrere zweite Pads (142) aufweist, umfasst, so dass erste Enden der mehreren ersten Pads (141) nahe der ersten Elektrodenschicht (11) jeweils mit mehreren streifenförmigen Elektroden verbunden werden, zweite Enden der mehreren ersten Pads (141) entfernt von der ersten Elektrodenschicht (11) über mehrere Fan-out-Bahnen (143) nahe der ersten Elektrodenschicht (11) jeweils mit den ersten Enden der mehreren zweiten Pads (142) elektrisch verbunden werden.

15. Verfahren zur Herstellung eines lichtanpassenden Glases nach Anspruch 14, wobei das Bilden der ersten und zweiten Spannungsübertragungsstrukturen (13, 14) ein Bilden der mehreren ersten Pads (141), der mehreren zweiten Pads (142) und der zweiten Spannungsübertragungsstruktur (13) durch einen einzigen Strukturierungsvorgang mit einem gleichen Material umfasst, oder

wobei das Bilden der ersten und zweiten Spannungsübertragungsstrukturen (13, 14) ein Bilden einer Übergangsschicht und der mehreren streifenförmigen Elektroden durch einen einzigen Strukturierungsvorgang mit einem gleichen Material umfasst, so dass die Übergangsschicht an einem zweiten Ende jedes der mehreren zweiten Pads (142) entfernt von der ersten Elektrodenschicht (11) angeordnet wird.

Revendications

1. Verre de réglage de la lumière, comportant une zone de réglage de la transmission et une région d'encapsulation entourant au moins partiellement la région de réglage de la transmission ; le verre de réglage de la lumière comprend : un premier substrat et un deuxième substrat opposés l'un à l'autre, et une couche de cristaux liquides colorants (30) entre le premier substrat et le deuxième substrat dans la région de réglage de la transmission, et un scellant de cadre (16) dans la région d'encapsulation ; dans lequel le premier substrat comprend une première base (10) et une première couche d'électrodes (11) sur une face de la première base (10) proche de la couche de cristaux liquides colorants (30) ; le deuxième substrat comprend une deuxième base (20) et une deuxième couche d'électrodes (21) sur un côté de la deuxième base (20) à proximité de la couche de cristaux liquides colorants (30); **caractérisé par le fait que**

une structure conductrice est prévue dans le scellant du cadre (16) ;
une première structure de transmission de tension (14) et une deuxième structure de transmission de tension (13) isolés électriquement l'une de l'autre se trouvent sur la première base (10) ;
la première structure de transmission de tension (14) est connectée électriquement à la première couche d'électrode (11) ; et
le scellant du cadre (16) recouvre au moins une partie de la deuxième structure de transmission de tension (13), de sorte que la deuxième structure de transmission de tension (13) soit connectée électriquement à la deuxième couche d'électrodes (21) par l'intermédiaire de la structure conductrice dans le scellant du cadre (16),
où la deuxième structure de transmission de tension (13) comprend : une première sous-structure de transmission (131) et une deuxième sous-structure de transmission (132) ;
la première sous-structure de transmission (131) et la première structure de transmission de tension (14) se trouvent sur un même côté de la région d'encapsulation ; et
la deuxième sous-structure de transmission (132) se trouve sur les autres côtés de la région d'encapsulation, à l'exception du côté pourvu de la première sous-structure de transmission (131) ; et est en forme de U et est positionnée sur un premier côté, un deuxième côté et un troisième côté de la région d'encapsulation ; la première sous-structure de transmission (131) est positionnée sur un quatrième côté de la région d'encapsulation ; et la première sous-structure de transmission (131) est connectée électriquement à la deuxième sous-structure de transmission (132) ; et
une extrémité de la première sous-structure de transmission (131) est une structure en forme de bloc, et l'autre extrémité de la première sous-structure de transmission (131) et la deuxième sous-structure de transmission (131) sont formées d'une seule pièce.

2. Verre de réglage de la lumière selon la revendication 1, dans lequel la deuxième structure de transmission de tension (13) se trouve dans une zone périphérique de la première couche d'électrodes (11) en entourant au moins partiellement la première couche d'électrode (11).

3. Verre de réglage de la lumière selon la revendication 1 ou 2, dans lequel la première couche d'électrodes (11) et la deuxième couche d'électrodes (21) comprennent toutes deux des électrodes en forme de plaque.

4. Verre de réglage de la lumière selon la revendication 3, dans lequel la première structure de transmission de tension (14) et la première couche d'électrodes (11) sont formées d'une seule pièce.

5. Verre de réglage de la lumière selon la revendication 1 ou 2, dans lequel la première couche d'électrodes (11) comprend une pluralité d'électrodes en forme de bandes ; et la deuxième couche d'électrodes (21) comprend une électrode en forme de plaque.

6. Verre de réglage de la lumière selon la revendication 5, dans lequel la première structure de transmission de tension (14) comprend une pluralité de premiers plots (141) et une pluralité de deuxièmes plots (142) ;

les premières extrémités de la pluralité de premiers plots (141) proches de la première couche d'électrodes (11) sont couplées à la pluralité d'électrodes en forme de bande, respectivement ;
les deuxièmes extrémités de la pluralité de premiers plots (141) distantes de la première couche d'électrodes (11) sont couplées électriquement aux premières extrémités de la pluralité de deuxièmes plots (142) proches de la première couche d'électrodes (11), par l'intermédiaire d'une pluralité de pistes en éventail (143), respectivement,
de préférence, la pluralité de deuxièmes plots (142) se trouve sur la première base (10) à l'extérieur de la zone d'encapsulation.

7. Verre de réglage de la lumière selon la revendication 6, dans lequel la pluralité de premiers plots (141) et la deuxième pluralité de plots se trouve dans une même couche et sont constituée d'un même matériau que la deuxième structure de transmission de tension (13) ; ou bien
le verre de réglage de la luminosité comprend en outre une couche de transition située à une deuxième extrémité de chacun des plots (142) de la deuxième pluralité distants de la première couche d'électrodes (11), et la couche de transition se trouve dans une même couche et est constituée d'un même

matériau que les électrodes en forme de bande.

8. Verre de réglage de la lumière selon l'une des revendications 6 à 7, dans lequel l'extrémité de la première sous-structure de transmission (131) est un troisième plot relié électriquement à la deuxième sous-structure de transmission (132) par une piste de connexion ;

le troisième plot et la pluralité de deuxièmes plots (142) sont disposés côte à côte ; et
la piste de connexion et les pistes de sortie en éventail (143) sont disposées côte à côte.

9. Verre de réglage de la lumière selon la revendication 7, dans lequel une projection orthographique de la deuxième couche d'électrodes (21) sur la première base (10) recouvre une projection orthographique de la première sous-structure de transmission (131) sur la première base (10).

10. Verre de réglage de la lumière selon l'une des revendications 8 à 9, comprenant en outre une couche isolante intercalaire, dans laquelle la couche isolante intercalaire recouvre au moins la première couche d'électrodes (11) et expose la première sous-structure de transmission (131) et la deuxième sous-structure de transmission (132).

11. Fenêtre de véhicule intelligente, comprenant le verre de réglage de la lumière de l'une des revendications 1 à 10.

12. Méthode de fabrication d'un verre de réglage de la lumière, comprenant :

former un premier substrat, comprenant : préparer une première base (10) et former une première couche d'électrodes (11), une première structure de transmission de tension (14) et une deuxième structure de transmission de tension (13) sur le premier substrat, où la première structure de transmission de tension (14) et la deuxième structure de transmission de tension (13) sont isolées électriquement l'une de l'autre ; la première couche d'électrodes (11) est pourvue d'une région de réglage de la transmission, et au moins une partie de la deuxième structure de transmission de tension (13) est pourvue d'une région de région d'encapsulation entourant au moins partiellement la région de réglage de la transmission ;
former un scellant de cadre (16) dans la région d'encapsulation de telle sorte que le scellant de cadre (16) comprend une structure conductrice et une première partie qui recouvre au moins partiellement la deuxième structure de transmission de tension (13) ;
former un deuxième substrat de sorte que le deuxième substrat comprend une deuxième base (20) et une deuxième couche d'électrodes (21) formée sur la deuxième base (20) ; et
aligner et assembler le premier substrat et le deuxième substrat de manière à ce que le scellant de cadre (16) soit disposé entre le premier substrat et le deuxième substrat et qu'il soit lié à la deuxième couche d'électrode (21) ,
où la deuxième structure de transmission de tension (13) comprend : une première sous-structure de transmission (131) et une deuxième sous-structure de transmission (132) ;
la première sous-structure de transmission (131) et la première structure de transmission de tension (14) se trouvent du même côté de la région d'encapsulation ; et
la deuxième sous-structure de transmission (132) se trouve sur les autres côtés de la région d'encapsulation, à l'exception du côté pourvu de la première sous-structure de transmission (131), et est en forme de U et est positionnée sur un premier côté, un deuxième côté et un troisième côté de la région d'encapsulation ; la première sous-structure de transmission (131) est positionnée sur un quatrième côté de la région d'encapsulation ; et la première sous-structure de transmission (131) est connectée électriquement à la deuxième sous-structure de transmission (132) ; et
Une extrémité de la première sous-structure de transmission (131) est une structure en forme de bloc, et l'autre extrémité de la première sous-structure de transmission (131) et la deuxième sous-structure de transmission (132) sont formés d'une seule pièce.

13. Méthode de fabrication d'un verre de réglage de la lumière selon la revendication 12, comprenant en outre la formation d'une couche isolante intercalaire sur la première couche d'électrodes (11) pour couvrir la première couche d'électrodes (11) et exposer la deuxième structure de transmission de tension (13), avant de former le scellant du cadre (16) dans la région d'encapsulation.

14. Méthode de fabrication d'un verre de réglage de lumière selon la revendication 12 ou 13, dans laquelle la formation de la première couche d'électrodes (11) et de la première structure de transmission de tension (14) comprend la formation de la première couche d'électrodes (11) et de la première structure de transmission de tension (14) en une seule pièce par un seul procédé de façonnage avec un même matériau ; ou bien
dans laquelle la formation de la première couche d'électrodes (11) et de la première structure de transmission de tension (14) comprend la formation

de la première couche d'électrodes (11) comprenant une pluralité d'électrodes en forme de bande et la première structure de transmission de tension (14) comprenant une pluralité de premiers plots (141) et une pluralité de deuxièmes plots (142), de sorte que les premières extrémités de la pluralité de premiers plots (141) à proximité de la première couche d'électrodes (11) sont connectées à la pluralité d'électrodes en forme de bande, respectivement ; les deuxièmes extrémités de la pluralité de premiers plots (141) distantes de la première couche d'électrodes (11) sont connectées électriquement aux premières extrémités de la pluralité de deuxièmes plots (142) proches de la première couche d'électrodes (11) par l'intermédiaire d'une pluralité de pistes en éventail (143), respectivement.

15. Méthode de fabrication d'un verre de réglage de la lumière selon la revendication 14, dans laquelle la formation des première et deuxième structures de transmission de tension (13, 14) comprend la formation de la pluralité des premiers plots (141), la pluralité de deuxièmes plots (142) et la deuxième structure de transmission de tension (13) par un seul processus de façonnage avec un même matériau, ou bien
dans laquelle la formation des première et deuxième structures de transmission de tension (13, 14) comprend la formation d'une couche de transition et la pluralité d'électrodes en forme de bande par un processus de façonnage unique avec un même matériau de sorte que la couche de transition soit disposée à une deuxième extrémité de chacune de la pluralité de deuxièmes électrodes (142) distantes de la première couche d'électrodes (11).

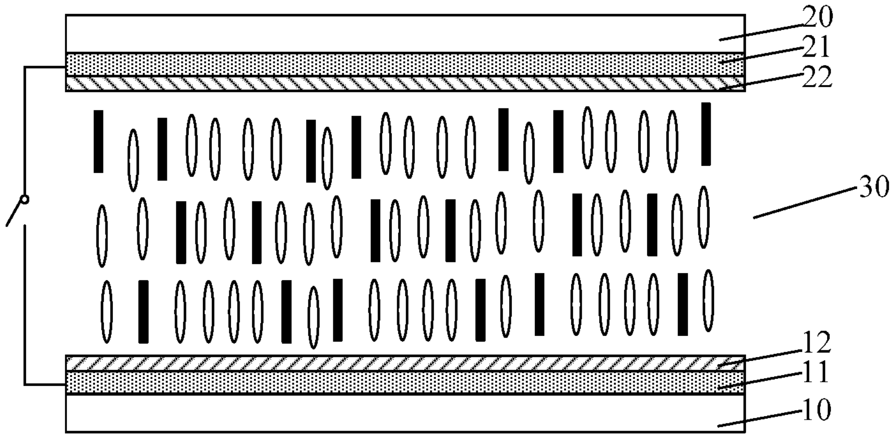

FIG.1

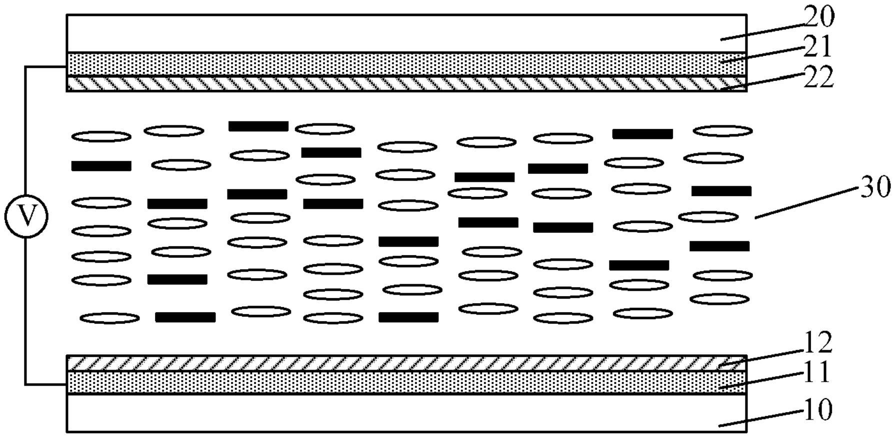

FIG.2

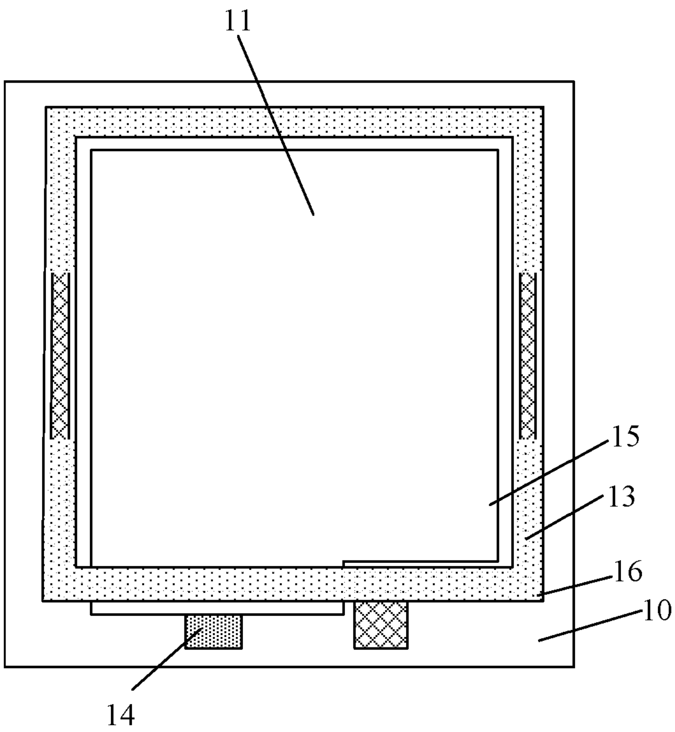

FIG.3

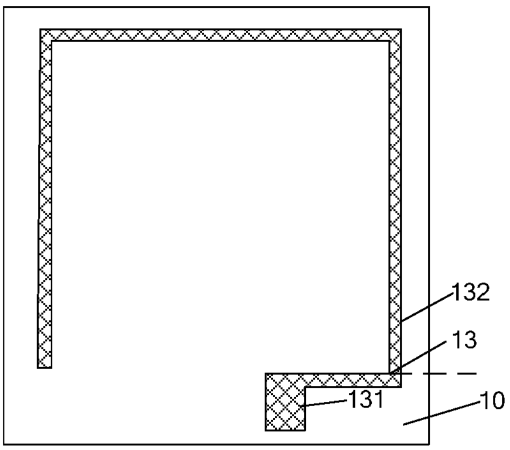

FIG.4

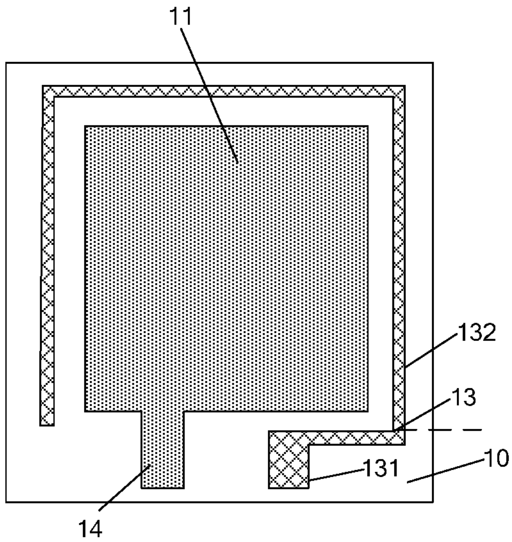

FIG.5

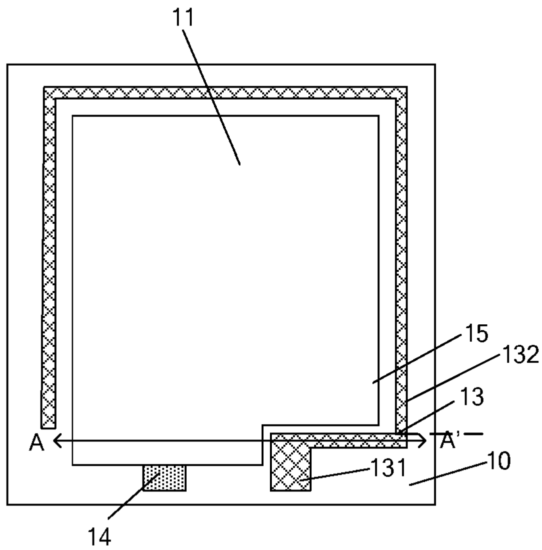

FIG.6A

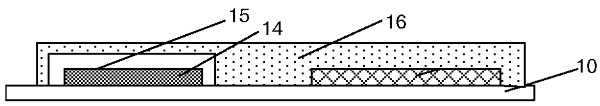

FIG.6B

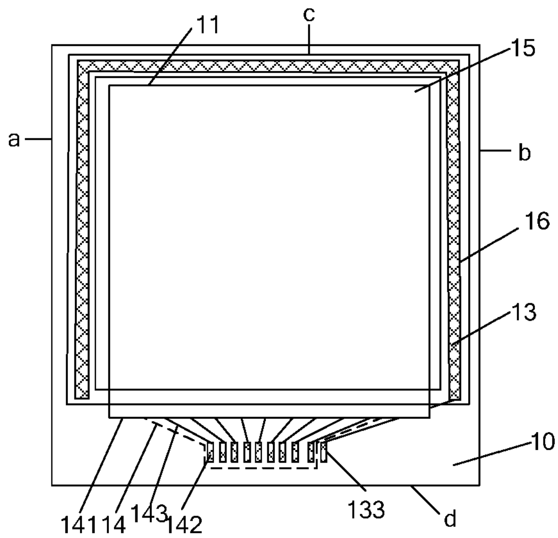

FIG.7

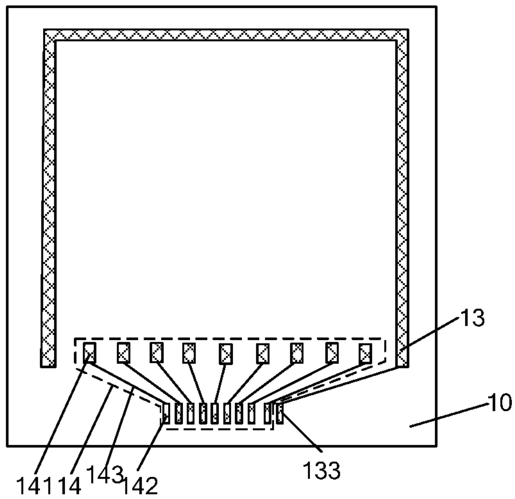

FIG.8

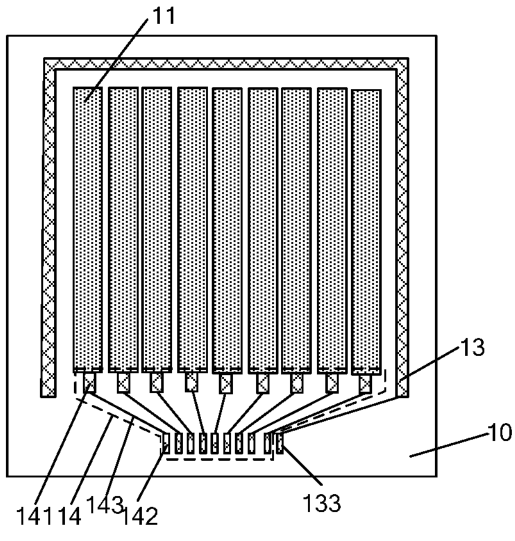

FIG. 9

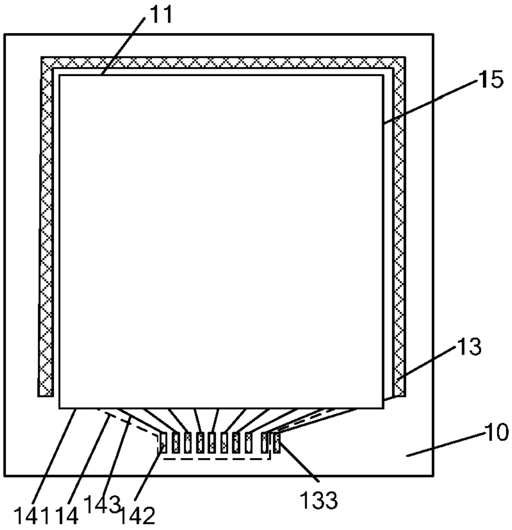

FIG. 10

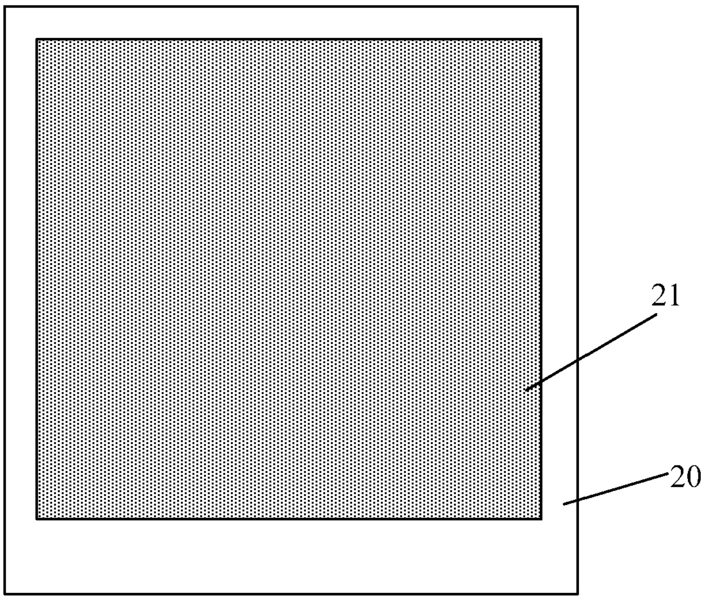

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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